

LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listing, of claims in the application.

What is claim:

1. (Previously Presented) A reaction system comprising:
 - a) a polyisocyanate component having a number averaged isocyanate functionality of at least 1.8 to 4.0;
 - b) an organic isocyanate-reactive component comprising at least fifty (50) percent by weight, based on the total weight of the organic isocyanate-reactive component, of an organic polyol having at least one aliphatic tertiary amine group and a number averaged hydroxyl equivalent weight of greater than 70 to less than 450; and
 - c) an isocyanate-reactive foaming agent consisting of water, carboxylic acids, or mixtures thereof, wherein the reaction system is separated into an A component containing the polyisocyanate component and a B component containing the isocyanate-reactive component and the isocyanate-reactive foaming agent, and wherein the A component and B component are blended to achieve an Index of 0.8 to 1.3.
2. (Original) The reaction system according to claim 1 wherein the polyisocyanate component is an aromatic organic polyisocyanate.
3. (Original) The reaction system according to claim 2 wherein the aromatic organic polyisocyanate is a polymethylene polyphenylene polyisocyanate.

4. (Original) The reaction system according to claim 1 wherein the organic isocyanate-reactive component further comprises a polyoxyethylene diol having a number averaged molecular weight of about 190 to about 800.
5. (Original) The reaction system according to claim 4 wherein the organic isocyanate-reactive component further comprises a propoxylated trimethylolpropane having a number averaged molecular weight of about 700 to about 1400.
6. (Original) The reaction system according to claim 1 wherein the reaction system further comprises less than fifteen (15) percent by weight of an internal mold release agent, based on the total weight of the reaction system.
7. (Previously Presented) A reaction system for producing unreinforced molded articles comprising:
- a) a polyisocyanate component comprising at least one organic polyisocyanate having a free organically bound isocyanate group concentration of between about 5% to about 50% by weight of the total weight of the polyisocyanate component;
 - b) an organic isocyanate-reactive component comprising at least fifty (50) percent by weight, based on the total weight of the organic isocyanate-reactive component, of an organic polyol having at least one aliphatic tertiary amine group; and
 - c) an isocyanate-reactive foaming agent consisting of water and at least one carboxylic acid, wherein the water constitutes at least 10% by weight, based on the total weight of the isocyanate-reactive foaming agent, wherein the reaction system is separated into an A component containing the polyisocyanate component and a B component containing the isocyanate-reactive component and the isocyanate-

reactive foaming agent, and wherein the A component and B component are blended to achieve an Index of 0.8 to 1.3

8. (Original) The reaction system according to claim 7 wherein the polyisocyanate component has a number averaged isocyanate functionality of at least 1.8 to 4.0.
9. (Original) The reaction system according to claim 7 wherein the polyisocyanate component is an aromatic organic polyisocyanate.
10. (Original) The reaction system according to claim 9 herein the aromatic organic polyisocyanate is a polymethylene polyphenylene polyisocyanate.
11. (Original) The reaction system according to claim 7 wherein the organic polyol has a number averaged hydroxyl equivalent weight of greater than 80 to less than 150 and greater than 1.7 ether linkages per molecule on a number averaged basis.
12. (Original) The reaction system according to claim 11 wherein the organic isocyanate-reactive component further comprises a polyoxyethylene diol with a number averaged molecular weight of about 190 to about 800.
13. (Original) The reaction system according to claim 11 wherein the organic isocyanate-reactive component further comprises a propoxylated trimethylolpropane having a number averaged molecular weight of about 700 to about 1400.
14. (Original) The reaction system according to claim 7 wherein the carboxylic acid is selected from the group consisting of oleic acid, ricinoleic acid, linoleic acid, linolenic acid, adipic acid, fumaric acid, maleic acid, succinic acid, and sebacic acid.
15. (Original) The reaction system according to claim 7, wherein the reaction system further comprises less than fifteen (15) percent by weight of an internal mold release agent, based on the total weight of the reaction system.

16. (Previously Presented) A process for preparing a molded foam comprising the steps of:

- a) providing a reaction system comprising: (i) a polyisocyanate component having a number averaged isocyanate functionality of at least 1.8 to 4.0, (ii) an organic isocyanate-reactive component comprising at least fifty (50) percent by weight, based on the total weight of the organic isocyanate-reactive component, of an organic polyol having at least one aliphatic tertiary amine group and a number averaged hydroxyl equivalent weight of greater than 70 to less than 450, and (iii) an isocyanate-reactive foaming agent consisting of water, carboxylic acids, or mixtures thereof, wherein the reaction system is separated into an A component containing the polyisocyanate component and a B component containing the isocyanate-reactive component and the isocyanate-reactive foaming agent, and wherein the A component and B component are blended to achieve an Index of 0.8 to 1.3;
- b) combining the reaction system to form a liquid reacting mixture;
- c) injecting the liquid reacting mixture into a mold;
- d) allowing the liquid reacting mixture to foam and cure in the mold to form a molded foam; and
- e) removing the molded foam from the mold.

17-18. (Cancelled)

19. (Previously Presented) The process according to claim 16 wherein the mold contains a facing material.

20. (Original) A molded foam produced according to the process of claim 16.

21. (New) The reaction system of claim 1, wherein the foaming agents consisted solely of water, carboxylic acid, or mixtures thereof.
22. (New). The process according to claim 16, wherein the foam's break strain to yield strain ratio is at least about 1.25.

Remarks

Currently pending in the application are Claims 1-16, 19-22 wherein Claims 1-16, 19 and 20 are rejected, and claims 21 and 22 are newly presented.

In view of the following remarks, Applicant respectfully requests reconsideration by the Examiner, and advancement of the application to allowance.

1. Rejection Under 35 U.S.C. § 103(a)

Claims 1-16 and 19 and 20 stand rejected under 35 U.S.C. § 103(a) as anticipated by U.S. Pat. No. 5,143,945 (Bodnar).

With respect to Claims 1-16 and 19 and 20, the Office Action admits that Bodnar differs from Applicant's claimed inventions in that Bodnar is not particularly limited to Applicant's selection of active hydrogen containing derived polyols of the equivalent weights. The Office Action also admits that Bodnar differs from Applicant's claimed inventions in that Bodnar does not require Applicant's claimed Index values. The Office Action, however, asserts that Applicant's claimed polyol and Index values could have been obtained from the teachings of Bodnar. Applicant asserts that the query is not whether one of ordinary skill in the art *could* have made the claimed invention. Instead the query is *would*, at the time of invention, one of ordinary skill in the art *have* been motivated to make the claimed invention. *See*, M.P.E.P. § 2145 (X) (B) (stating that varying the parameters of a disclosure absent some indication of which parameters are important is an "obvious to try" type argument and constitutes impermissible hindsight reconstruction). Additionally, the Supreme Court recently restricted the appropriateness of the obvious to try argument to situations where there are "predictable solutions". *See, KSR Int'l v. Teleflex Inc.*, 500 U.S. ____ (2007). Applicant's respectfully asserts

that, at the time of invention, the benefit of using its specifically claimed polyols was not predictable.

Applicant notes that Bodnar discloses rigid polyurethane-polyisocyanurate foams. *See*, Bodnar abst. Without wishing to be bound by the theory, Applicant asserts that Bodnar is interested in achieving a polyisocyanurate network. Such networks require the use of a trimerization catalyst, which promote isocyanurate formation only at high Indexes—on the order of 2.0 to 3.5. *See*, Bodnar at Col 8, lines 32-34 (requiring the use of a trimerization catalyst). These results are seen in the examples of Bodnar, which exhibit Index ranging from 2.5 to above 3.1. Trimerization catalysts are generally considered ineffective at Indexes below 2.0, and Bodnar lists a lower Index limit of 1.5. *See*, The Polyurethanes Book, Randall, D.; Lee, S., p. 232 (stating, “polyisocyanurate (PIR) foams are made with indexes in the range of 200 to 350.”). A copy of the relevant portion of the reference is attached hereto.

Therefore, one of ordinary skill, relying on Bodnar, would not have seen the benefit of conducting experiments at an Index lower than 1.5, which is outside of Applicant’s claimed range. Moreover, one of ordinary skill in the art would not have been able to predicate the beneficial result seen by excluding the trimerization catalyst, decreasing the Index limit, and incorporating the claimed polyol.

Newly presented Claim 21 requires that the foaming agents consist solely of water, carboxylic acid, or mixtures thereof. Applicant asserts that without additional blowing agents the foam will have a thermal conductivity that is not suitable for the uses anticipated by Bodnar. *See*, Bodnar Col. 3, lines 5-10 (stating, “[t]he rigid foams ... are particularly suited for ... insulation for tanks, pipes, refrigerator and freezer cabinets and the like); *see also*, The

Polyurethanes Book, Randall, D.; Lee, S., p. 236 (including a chart listing the thermal conductivity of CFC-11, HCFC-141b, HCF-134a, and CO₂ as 0.0074, 0.0091, 0.0123, and 0.0153 W/n-K respectively.). A copy of the relevant portion of the reference is attached hereto.

The Office Action asserts that the “omission of an element with consequent loss of function is obvious.” Applicant, however, asserts that one does not arrive at its claimed inventions through the mere omission of the blowing agent element within Bodnar. Instead, one would have to omit the blowing agent element, as well as select a hydrogen containing derived polyols of the equivalent weights, and substantially reduce the Index. Applicant asserts that Bodnar’s disclosure of its intended use teaches away from such a combination of changes. Accordingly, such a combination of changes could only be made by relying on impermissible hindsight reconstruction.

Newly presented Claim 22 requires that the foam’s break strain to yield strain ratio is at least about 1.25. Applicant asserts that the polyisocyanurate foams of Bodnar are known to be brittle, relative to Applicant’s disclosed foams. Accordingly, Applicant asserts that the foams of Bodnar would exhibit a relatively lower break strain. Therefore, the ratio of break to yield strain is likely to be lower than Applicant’s claimed range of about 1.25.

Applicants therefore respectfully request that the rejection to claims 1-16 and 19 and 20 under 35 U.S.C. § 103(a) in view of Bodnar be withdrawn, and an indication of allowability directed toward claims 1-16 and 19-22 be entered.

2. Request for One-Month Extension of Time

Pursuant to 37 C.F.R. § 1.136(a), Applicants hereby request a one (1) month extension of time to file a response to the Office Action Mailed January 4, 2007. This request extends the original due date of April 4, 2007 one (1) month to May 4, 2007. Applicant has enclosed the \$120 fee for a large entity.

3. Conclusion

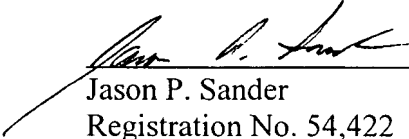
In view of the foregoing remarks, Applicant respectfully submits that the application is now in condition for allowance, and respectfully requests issuance of a Notice of Allowance directed towards the pending claims.

Applicant authorized the Commissioner to charge the \$120.00 fee for a one-month extension of time to Deposit Account 07-0153, Gardere Wynne Sewell LLP. Should any other fee be due in connection with the filing of this document, the Commissioner for Patents is hereby authorized to deduct said fee from Deposit Account No. 07-0153.

Please date stamp and return the enclosed postcard to acknowledge receipt of this material.

5/3/07
Date

Respectfully submitted,


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Library of Congress Cataloging-in-Publication Data:

The Huntsman polyurethanes book/edited by Stephen Lee.
p. cm.

Includes bibliographical references and index.

ISBN 0-470-85041-8

1. Polyurethanes. I. Lee, Stephen.

TP 1180.P8 H86 2002

668.4'239--dc21

2002033074

British Library Cataloguing-in-Publication Data:

A catalogue record for this book is available from the British Library.

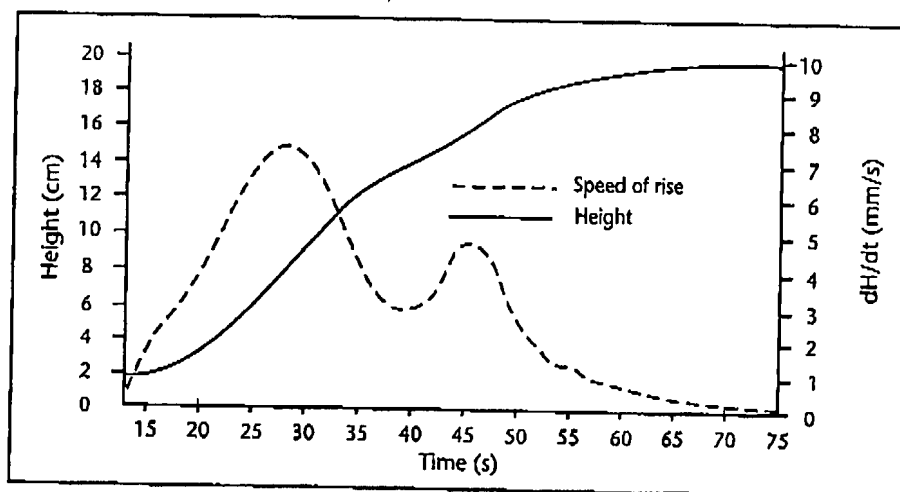
ISBN 0 470 85041 8

Design, layout and typesetting by Dunholm Publicity Ltd.
Jacket design by C² creative communications.
Printed and bound in The United Kingdom.

The choice of polyols is much broader than polymeric MDIs with the key products being polyethers based on sorbitol and sucrose as they have a high functionality, four to seven, and are cost effective. Polyethers based on glycerol are added to modify the reactivity and to improve the processing whilst amine-based polyols are used for specific applications such as spray foam, where a high reactivity is required. Aromatic polyester polyols are widely used as they produce foam with better fire properties than polyethers, but their high viscosity limits their use to applications where flow is not critical. The choice of polyol also depends on the compatibility of the blowing agent.

* The isocyanate index has a big impact on the processing and end properties and whilst polyurethane (PUR) foams are normally moulded over an index range of 90 to 130, with final properties relatively constant across the range, polyisocyanurate (PIR) foams are made with indexes in the range 200 to 350. Due to the large isocyanate excess isocyanurate ring formation takes place, but this will only happen at a late stage of the reaction when the temperature is high. This ring formation itself is exothermic causing the foam to rise again, a phenomenon known as 'second rise', shown in Figure 15-3, which can lead to processing difficulties. However, these can be limited by appropriate catalyst selection. PIR foams have an improved fire performance and reduced smoke generation compared to PUR foams, but at indexes above 350 they tend to be friable and have poor adhesion.

Figure 15-3 Second rise in PIR foams



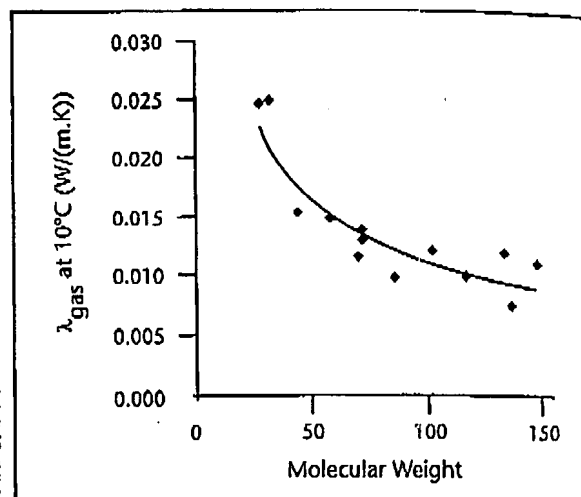
Blowing agents

The change in blowing agents has been one of the central themes within rigid foam development work for the past decade and full details of the changes are provided in Chapter 8.

Table 15-1 Relation between molecular weight and λ_{gas}

	MW (g/mol)	λ_{gas} at 10°C (W/(m.K))
HFC-11	137	0.0074
HFC-22	86	0.0102
HFC-141b	117	0.0091
HFC-134a	102	0.0123
HFC-245fa	134	0.0119
HFC-365mfc	146	0.0108
n-pentane	70	0.0135
i-pentane	72	0.0128
n-pentane	72	0.0167
n-butane	58	0.0148
CO ₂	44	0.0153
N ₂	28	0.0246
O ₂	32	0.0249

Figure 15-8 Relation between molecular weight and λ_{gas}



Several of the physical blowing agents have a boiling point well above the temperature at which the foam is used under service conditions therefore this part of the mixture would condense. This will affect the gas composition and hence also its λ_{gas} . Since the other gases present, carbon dioxide and air, have a higher λ_{gas} condensation than the physical blowing agent it will increase the λ_{gas} contribution to the total thermal conductivity.

Thermal conductivity ageing

All insulating foam materials that are blown with an insulating gas, such as polyurethane, polyisocyanurate, extruded polystyrene and phenolic foam, undergo changes in cell gas composition over time, accompanied by changes of the thermal conductivity.

Basic theory

For freshly made foam, the cell gas composition will consist of physical blowing agent and/or carbon dioxide with the amount of air in the cells limited to the small traces, which were dissolved in the chemicals. As the foam ages air will gradually enter the foam driven by the difference in partial air pressure in the foam cells and atmospheric pressure. Besides air ingress, the physical blowing agent and carbon dioxide will diffuse out of the foam, again driven by differences in partial pressure. The rate of diffusion will depend on many parameters, but as a general trend, the carbon dioxide loss will be a lot faster than the air ingress, which, in turn, is much faster than physical blowing agent loss.

Attorney(s): Jason P. Sander

Deposit Account Amount: \$120.00

Client/Matter#: 126505-1018

Serial/Patent No.: 10/772,516

Title: Unreinforced Reaction Injection Molded Structural Foams

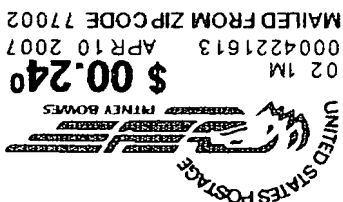
Inventor(s): Trent A. Shidaker Confirmation No.: 5676

Today's Date: 5/3/07 Due Date: 5/4/07 App. filed with USPTO: 2/5/04

APPLICATION FOR PATENT [Check all items that apply]:

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Library of Congress Cataloging-in-Publication Data:

The Huntsman polyurethanes book/edited by Stephen Lee.
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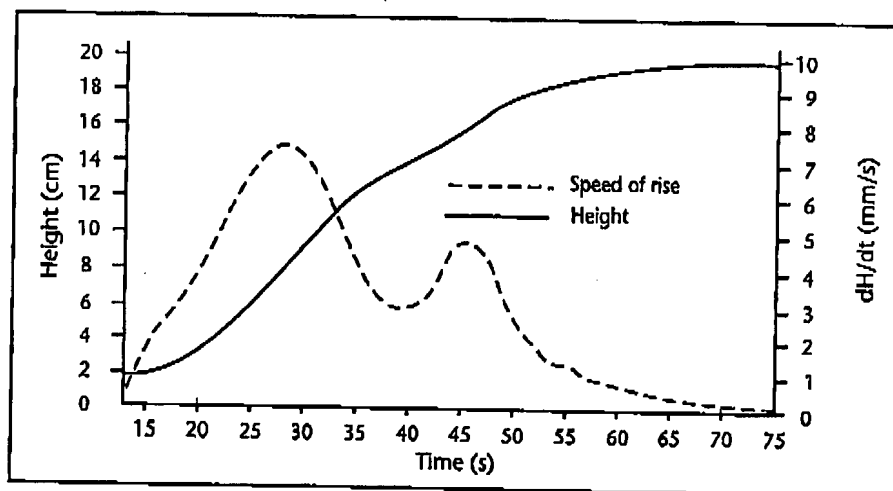
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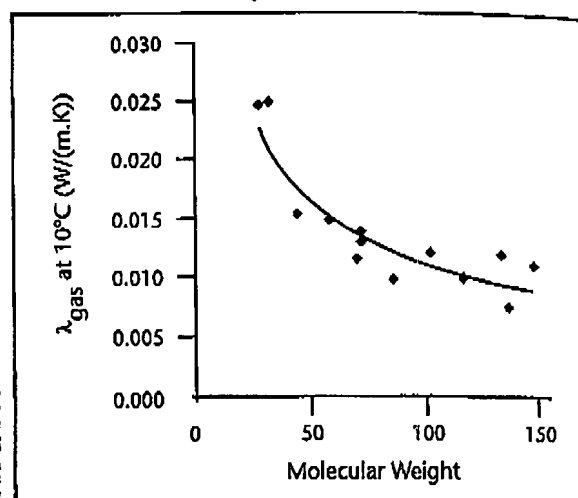
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